Attorney Docket 5360

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Sir:

Transmitted herewith for filing is the patent application of:
Inventor: Robert J. Monson et al.
For: USER COUPLED WORKSPACE SHOCK ISOLATION SYSTEM
Enclosed are:

[x] 3 sheets of drawing.

[ ] An assignment of the invention to xc

[ ] A certified copy of a _____ application.

[ ] An associate power of attorney.

[ ] A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27.

[x] PTO 1449

The filing fee has been calculated as shown below:

BASIC FEE				$690.00
TOTAL CLAIMS	- 20 =	0	X 10=	0
INDEPENDENT CLAIMS	- 3 =	0	X 30=	0
TOTAL				$690.00

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[x] Any filing fees under 37 CFR 1.16 for presentation of extra claims.

JACOBSON AND JOHNSON

By

Carl L. Johnson, Reg. No. 24,273
Attorneys for Applicant
MidAmerica Bank Building, Suite 260
Suite 285
One West Water Street
St. Paul, Minnesota 55107-2080

Telephone: 651- 222-3775

Attorney file: 5360r3
EA-00049

SPECIFICATION

TO WHOM IT MAY CONCERN

BE IT KNOWN, That we Robert J. Monson, a citizen of the United States, residing in St. Paul, Ramsey County, State of Minnesota, Allen L. Arndt, a citizen of the United States, residing in Burnsville, Dakota County, State of Minnesota and Samuel A. Runge, a citizen of the United States, residing in Forest, Bedford County, State of Virginia, have invented new and useful improvements in USER COUPLED WORKSPACE SHOCK ISOLATION SYSTEM of which the following is a specification.

FIELD OF THE INVENTION

This invention relates generally to a shock isolation system and, more particularly, to a shock isolation system that simultaneously isolates the platform, the operator, the operator station and the operator's console to thereby minimize operator exposure to shock and vibration.

BACKGROUND OF THE INVENTION

As anyone who has driven an automobile knows, it has long been known that drivers of commercial and pleasure vehicles are protected from vibration and shock by mounting shock absorbers and springs between the frame of the vehicle and the body of the vehicle. These vehicles generally have a two-stage vibration and shock-isolation system. As the vehicles pass over rough terrain the air-inflatable tires provide an air cushion to absorb some of the impact while further impact and vibration is absorbed by springs and shock absorbers that connect the frame to the body of the vehicle. It has also been known to incorporate similar shock systems in agricultural vehicles such as tractors or the like. A typical prior art system for a tractor is shown in U.S. patent 4,392,546.

In contrast to the commercial and pleasure vehicles which can weigh a few tons, there is a second category of heavier equipment that weighs thousands of tons. In addition, the heavier equipment, which includes combat vehicles such as ships, submarines, tanks and the like is generally supported directly in the water or directly on a land surface with no air cushion. While designers of personal and commercial craft have relied on the combination of air inflatable tires and shock and vibration supports to minimize vibration and shock to the operator, the designers of large water craft, such as military battleships, cannot. Instead, the large mass of the ship is used to partially isolate the operator and the operator's equipment from damage. That is, since the ships are so massive the mass of the ship can absorb a large impact before it is felt by a ship operator or a ship console. In order to further protect the electronic consoles on the large combat ships

from the effects of impacts from high "g" explosive shocks caused by artillery, bombs, torpedoes or the like as well as from vibration, each of the consoles of the large ships are generally mounted with a set of shock supports that isolate the electronic console from the deck of the ship. It should be pointed out that by explosive shocks it is generally meant to mean shocks which may impart in excess of 5 g's for a duration of 100 milliseconds or more. It is these type of high impact shocks that can cause havoc often resulting in operator injury caused by impact with the console or the deck of the equipment.

A prior art way to prevent injury to the operator on a ship is to include a seat belt to maintain the operator in the operator's chair should the ship supporting the operator station be hit. However, oftentimes the impact on the deck of such shocks is sufficiently great so that even though the operator is restrained, the operator is still injured or killed. In other instances operators, which are not or cannot be restrained, are injured or killed because it is simply not feasible to use a safety belt. Thus, even though the ship might still be functional, the operators required to operate the ship can be so severely injured so as not to be able to operate their stations, thus possibly placing the remaining crew and the ship in jeopardy.

The present invention provides an improvement to the prior art shock isolations system by isolating a deck platform from the ship to form a unitary isolation platform which simultaneously supports both the operator station and the operator's console. The isolation platform generally includes a unitary work deck, which is considerably less massive than the ship, so that the isolation platform can be supported from the deck by conventional vibration and shock absorbers so that the effect of explosive impacts on the deck can be simultaneously isolated from both the operator station and the operator console to thereby minimize the chance of injury or death to the operator from displacement of the equipment relative to the operator.

DESCRIPTION OF THE PRIOR ART

U.S. patent 4,128,217 shows a type of small vehicle isolation system that isolates the crew seat for an aircraft. The crew seat is mounted directly to the body of the aircraft, with a set of rails being capable of distorting up to 10 degrees during an impact.

U.S. patent 4,392,546 shows a system to prevent an operator from the effects of undue motions as the tractor travels over uneven terrain by having an operator station for a tractor cab with the console and the operator mounted on a platform that is coupled to the frame of the tractor.

U.S. patent 4,892,051 shows a conventional shock-isolation method and apparatus for a large ship mounted device with a shock isolation apparatus mounted between the fire-control system and the deck of the ship.

U.S. patent 4,987,320 discloses a spring shock system for use in a marine vessel.

U.S. patent 4,989,684 shows an improved vibration damping and shock absorber for the cab of a truck.

U.S. patent 5,520,259 shows a vibration-damping and shock-absorbing cabin for construction equipment.

U.S. patent 5,579,859 discloses springs and shock dampers for supporting a standing surface on a material-handling vehicle.

U.S. patent Re. 29,123 discloses a tractor with a unitary cab and control console that are vibrationally isolated from the tractor chassis.

BRIEF SUMMARY OF THE INVENTION

Briefly, this invention comprises a shock-isolation system including an isolatable platform having an operator station and a console which are secured to the platform in a non-displacement mode with the platform supported in a displaceable mode through a shock mount that shockingly isolates the platform to thereby simultaneously isolate the operator, the operator station and the console as a unitary system and to further shockingly isolate the operator, the operator station and the console from each other to thereby minimize injury to the operator due to an external high "g" impact to the support for the shock-isolation system.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional view of a portion of a deck of a ship;

Figure 2 shows a side view of ship being impacted by explosives; and

Figure 3 shows a perspective view of an island platform for vibration and shock isolation mounting.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows a cross-sectional view of a portion of a ship deck with a console 14 and a console operator station 15 comprising a chair 16 supported by a unitary rigid deck platform 11 with the deck platform 11 mounted substantially coextensive with deck 10 to provide operator access thereto. Typically, console 14 contains electronic equipment such as monitors, computers and the like which are normally individually isolated from a supporting platform by shock and vibration mounts within the console.

The console chair 16 is secured to the top 11a of platform 11 so as to prevent displacement with respect thereto. Top 11a comprises a foot deck to support either a standing or sitting operator. Similarly, console 14 is secured directly to top 11a of platform 11 so as to prevent displacement with respect thereto. The securing of console 14 and console operator station 15 to the rigid platform 11 prevents relative displacement of the console operator station 15 and the console 14 with respect to each other. By mounting the console operator station 15 proximate console 14, it enables an operator in the console operator station 15 to interact with console 14 while the fixed mounting of the operator station and the console prevents the operator 9 from being impacted by displacement of the console and the operator station relative to one another. Thus, in the present invention, the operator station, the island platform and the console substantially operate as a single dynamic unit, to decrease the chances of injury to an operator thereon.

The elimination of the conventional isolated shock and vibration mounts for each piece of electronic equipment not only reduces the chances of injury to an operator but it also provides greater above-deck usable space since the space in the consoles normally used for shock mounts is eliminated by use of a single set of shock and vibration mounts to support the operators platform 11.

The operator platform 11 is supported by shock mounts 12, 13 and 14 which isolate high "g" shocks present in ship deck 20. While the isolation of the operator from high "g" shocks using only shock absorbers is known, it should be understood that oftentimes shock absorbers are incorporated with vibration dampers so that both shock and vibration can be inhibited in the same mounting device. Thus, the invention is usable with either shock supports alone or shock supports that include vibration attenuators or absorbers. If the shock supports are sufficiently responsive in relation to the inertia of the support platform, the support platform can maintain a

substantially fixed spatial orientation, which further lessens the opportunity of injury to the operator since the operator will not normally be fixedly secured to the support platform.

Ship deck 20 is shown to comprise a lower frame 26 having a top surface 26a which supports an upper deck 22 through a set of support beams 21, 23. From Figure 1 it is apparent that one end 11c of platform 11 is spacedly isolated from top deck 22 by an air gap and opposite end 11d is spacedly isolated from top deck 22 by an air gap. Similarly, the opposite sides of platform 11 are spacedly isolated from top deck 22 deck 11 by air gaps. The deck 11 therefor comprises a unitary operator island that can move relative to top deck 22 without directly contacting top deck 22. Consequently, the vibration and shock mounts, which support platform 11 on deck 20, reduce shocks and attenuate vibrations so that the island deck platform 11, including the operator 9 receive little of any effect from a high "g" impact on the ship.

In order to understand the operation of the present invention, reference should be made to Figure 2 which shows a ship 30 of mass M_1 floating in a body of substantially incompressible fluid such as water 8. The ship includes a pilot house 31 and an operator room 32 which contains the operator and equipment platform 10 shown in Figure 1. It will be appreciated that the mass M_2 of the operator and equipment platform 10 is many hundred-fold less than the mass M_1 of the ship.

Ship 30 is shown receiving impacts from a bomb explosion 37 and about to receive further impacts from explosions of bombs 35 and 36. In conventional systems the mass M_1 of the ship is sufficiently large so as to absorb many impacts without disrupting either an operator or an operator control station. However, impacts do occur which do not destroy the ship but are sufficiently great so that the mass of the ship cannot effectively protect the operator or the operator equipment. In order to respond to these type of hits, previous designs taught the construction of consoles that were isolated from the deck 20 by individual vibration and shock

mounts. One of the adverse side effects was that the operators who are standing or sitting on the deck might be hit by either the deck or the console or both as the console responds to an impact. The present invention minimizes operator injury by rigidly coupling the operator control station to the operator console so as to prevent relative movement therebetween. The present provides a four-fold effect: first, the large mass disparity between the ship 30 and the operator platform 11 provides a damping effect on forces transmitted to frame 26; second, the displacement forces on frame 26 are damped by vibration and shock mounts 12, 13 and 14 which serve to attenuate the forces to platform 11; third, if displacement forces are sufficiently large so as not to be effectively diminished by vibration and shock mounts 12, 13 and 14, the coupling of the operator platform 15 to the console with the operator 9 being supported by the platform 11 minimize the chances of injury to the operator 9 due to relative displacement of the equipment with respect to the operator; and fourth, the inertia of the platform and the spaced mounting of the platform 11 from the deck 22 helps maintain the platform in momentarily fixed spatially position so that the operator, who is not fixedly secured to the platform 11, is not thrown into or from the platform.

It will be envisioned that operator safety is enhanced because the inertia of the platform limits the platform and operator movement while the operator, who is now part of the system, tends to move in conjunction with the station components rather than having the components of the station move relative to the platform 11 and the operator 9 which could cause injury to the operator.

In the embodiment shown, the platform 11 is spaced from the ship frame 26 and solely supported therefrom by a shock mount that includes shock attachments 12, 13 and 14. Typically, the platform is made of metal and for a single operator the unitary platform can have a surface area of 20 to 30 square feet.

Figure 3 shows a perspective view of an island platform 40 for vibration and shock isolation with platform 40 comprising a foot deck 41 having a mounting member 42 for rigidly securing an operator's platform thereon and a wall 43 having mounting members 44 for mounting electronic equipment thereto. Both the operator platform and the electronic equipment are fixedly mounted thereto without the benefit of vibration or shock absorbers. Attached to the underside of island platform 40 is a shock mount comprising a set of vibration and shock absorbers 45, 46 and 47. The concept of vibration and shock absorbers are known in the art and, in one type, generally comprise some type of spring that will yield in response to a sudden force and some type of shock absorber that absorbs shock and also quickly damp out harmful shocks and vibrations.

The present invention provides a combat shock-isolation system for isolating the effects of explosion shocks that could imperil the operation of a ship which is directly supported by a substantially incompressible medium such as a body of water. The ship has a first mass with the ship having a deck thereon. Located thereon is a deck platform having a second mass substantially less than the first mass. The deck platform is spacedly mounted from the deck so as to permit relative displacement between the deck and the ship without contact therebetween. Located on the deck platform is a console which is fixedly mounted on deck platform so as to move with the deck platform. Also located on the deck platform is a console-operator station, which is also fixedly mounted to the deck platform so as to move with the deck platform 11 with the console-operator station mounted proximate the console 14 to enable an operator in the console-operator station 15 to interact with the console. The deck platform 11 is solely supported by a shock mount comprising shock attachments 12, 13 and 14 which is connected to the deck platform and to the ship to support the deck platform 11 so that an explosion shock received by the ship is simultaneously isolated from both the console-operator station and the console by the

shock mount supporting the deck platform to thereby prevent the console-operator station and the console to move in relation to each other and thereby minimize injury to the operator thereon.

In a different sense, the invention comprises a spatial isolation system that utilizes the inherent inertia of the unitary platform 11 to momentarily spatially isolate the unitary platform 11 from the effects of high "g" forces. Further, operator safety is obtained by having an operator station 15 and the console 14 fixedly secured to the unitary platform 11 thereby further inhibiting opportunity for operator injury by simultaneously preventing the operator station and the unitary platform from moving relative to one another.

I claim:

1. A combat shock-isolation system for isolating the effects of shocks that could imperil the operation of a ship which is directly supported by a substantially incompressible medium comprising:

a ship having a first mass, said ship having a deck thereon;

a deck platform said deck platform having a second mass substantially less than the first mass, said deck platform spacedly mounted from said deck so as to permit relative displacement between said deck and said ship without contact therebetween;

a console, said console fixedly mounted on said deck platform;

a console-operator station, said console-operator station fixedly mounted on said deck platform with said console-operator station mounted proximate said console to enable an operator in the console-operator station to interact with said console; and

a shock mount connected to said deck platform and to said ship to support said deck platform so that a shock received by the ship is simultaneously isolated from both the console-operator station and the console by the shock mount supporting the deck platform to thereby prevent the console-operator station and the console to move in relation to each other and thereby minimize injury to the operator thereon while simultaneously suppressing shock and vibration energy into the operator and the console-operator station.

2. The shock-isolation system of claim 1 wherein the first mass is a minimum of one hundred-fold larger than the second mass.

3. The shock-isolation system of claim 1 wherein the console operator platform includes a chair for a console operator to sit therein when interacting with the console.

4. The shock-isolation system of claim 1 wherein the console is a control console with said deck platform mounted coextensive with said deck to provide operator access thereto.

5. The shock-isolation system of claim 1 wherein the deck platform is solely supported therefrom by said shock mounts.

6. The shock-isolation system of claim 1 wherein the deck platform comprises a rigid island platform with the operator station fixedly secured thereto.

7. The shock-isolation system of claim 6 wherein the console is fixedly secured with vibration mounts to said rigid island platform so that console and said rigid island platform operate as a dynamic unit.

8. A shock-isolation system for isolation of shocks from a supporting structure comprising:

a unitary platform, said unitary platform having an operator station thereon;

a first mounting member for rigidly securing a console to said unitary platform;

a shock mount for supporting said unitary platform in a condition where the sole support for the unitary platform is the shock mount so that the unitary platform is free to remain spatially fixed to isolate the unitary platform from the effects of high "g" shocks with the operator station and the unitary platform further inhibiting opportunity for operator injury by simultaneously preventing the operator station and the unitary platform from moving relative to one another.

9. The shock-isolation system of claim 8 including a second mounting member for securing the operate station thereto.

10 The shock-isolation system of claim 9 wherein the operator station includes a foot deck for an operator.

11. The shock-isolation system of claim 10 wherein the shock-isolation system is only supported by said shock mount.

12. The shock-isolation system of claim 11 wherein the unitary platform incudes an upright wall with said upright wall including the first mounting member.

13. The shock-isolation system of claim 12 wherein the unitary platform is metal.

14. The shock-isolation system of claim 13 wherein the unitary platform has a surface area of about 20 to 30 square feet.

15. The shock-isolation system of claim 8 wherein the shock mount provides vibration damping.

16. The shock-isolation system of claim 8 wherein the shock mount simultaneously isolates the operator station and the unitary platform from shock and vibration.

17. The shock-isolation system of claim 8 wherein the shock mount dampens vibration and shock to minimize the relative motion between the operator station and the operator.

18. A method of isolating an operator on a structure from injury by an operator's console comprising the steps of:

supporting a portion of the structure with shock mounts connected to the structure and the portion of the structure to provide shock isolation to the portion of the structure from the structure; and

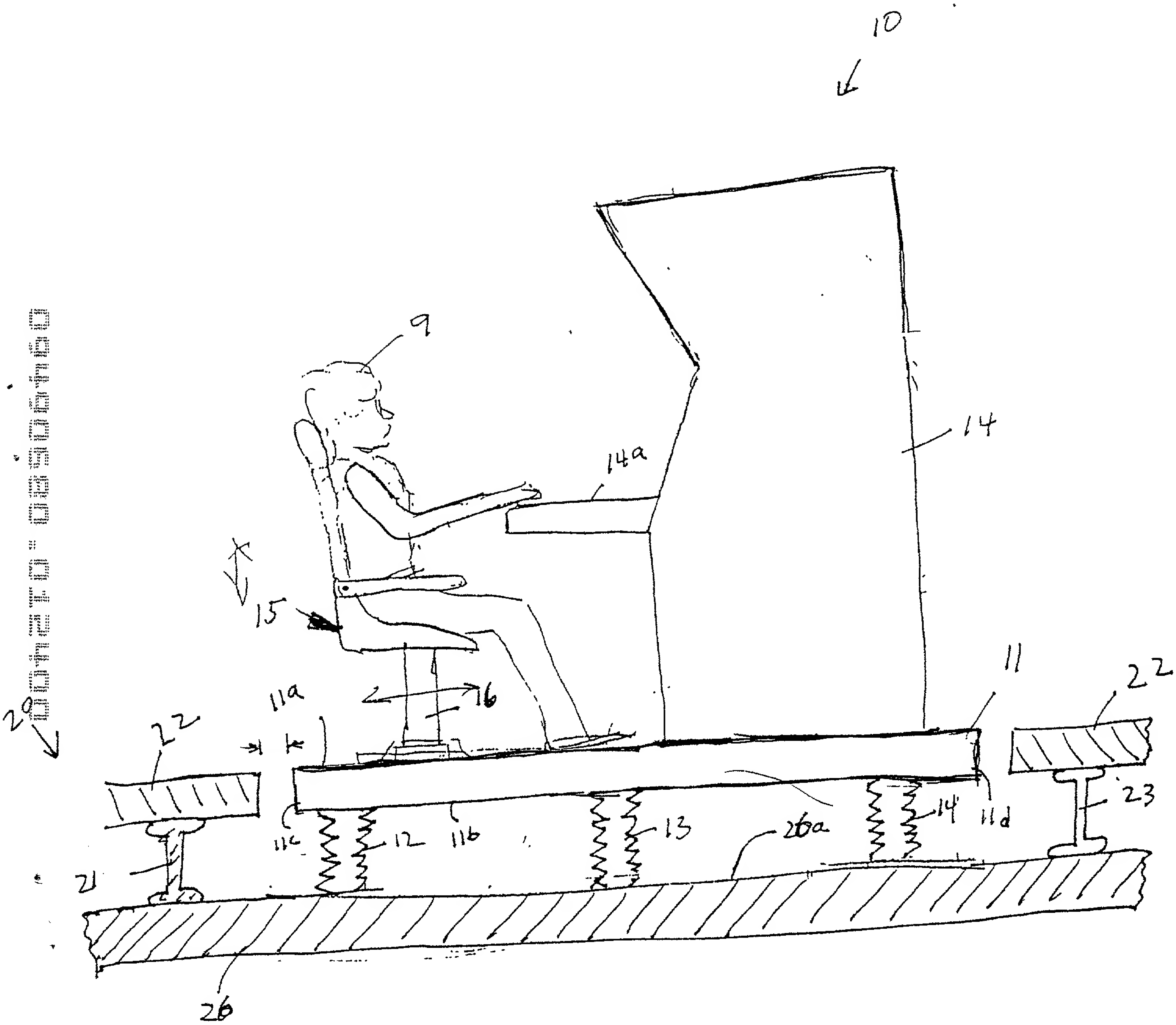
mounting the operator's console directly to the portion of the structure to prevent relative motion between the portion of the structure and the operator's console so that when a shock is transmitted to the structure the portion of the structure and the operator's console are shock isolated as a unit from the structure to thereby minimize injury to an operator.

19. The method of claim 18 including the step of including vibration dampers in the shock mounts.

20. The method of claim 18 including the step of solely supporting the portion of the structure from the structure bthe shock mounts.

ABSTRACT

A shock-isolation system having a platform for supporting an operator station and a console which can both be fixedly secured to the platform in a relative non-displacement mode with the platform supported by a shock mount that simultaneously isolates the platform including an operator, the operator station and the console as a unitary component from high "g" shock to thereby minimize injury to an operator due to impact with either the operator station, the console or the platform.



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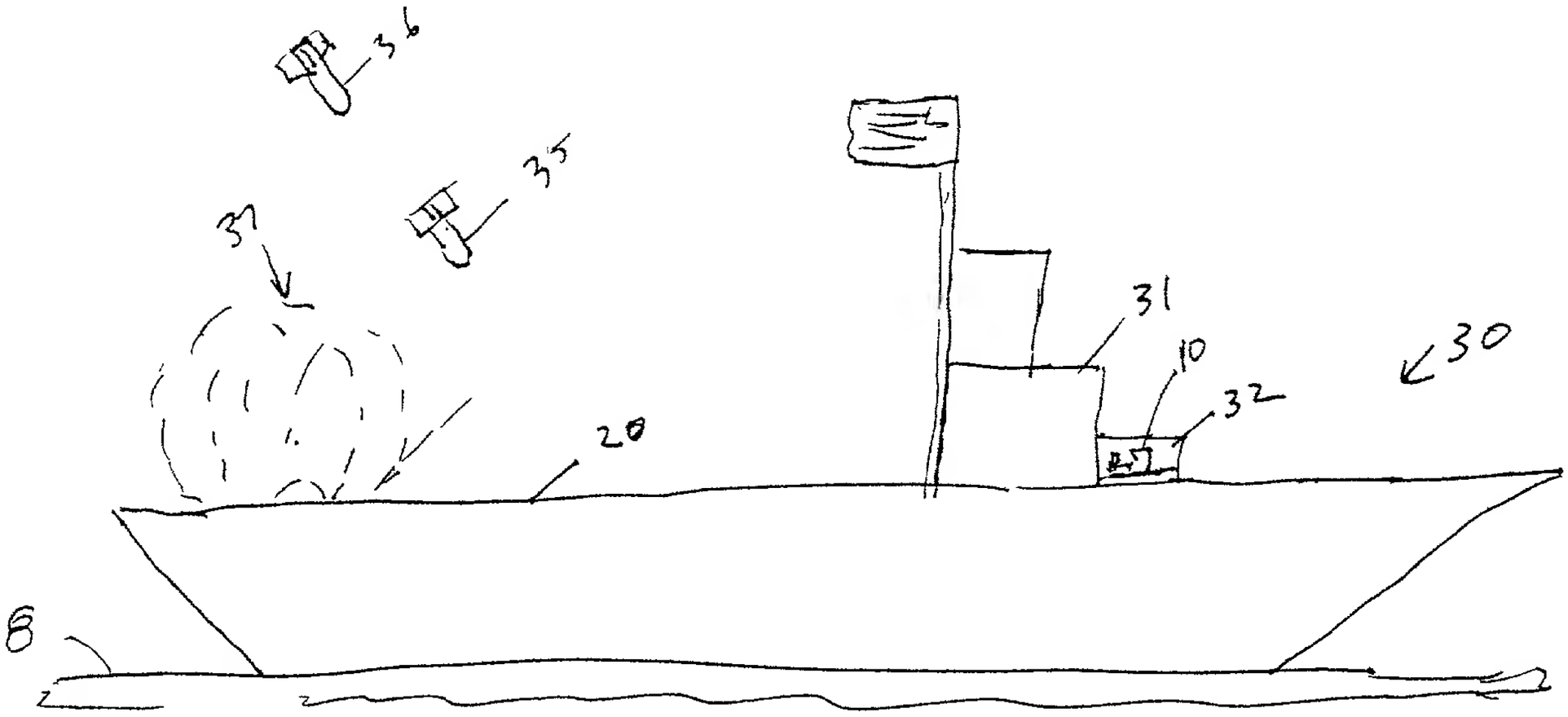

FIG 2

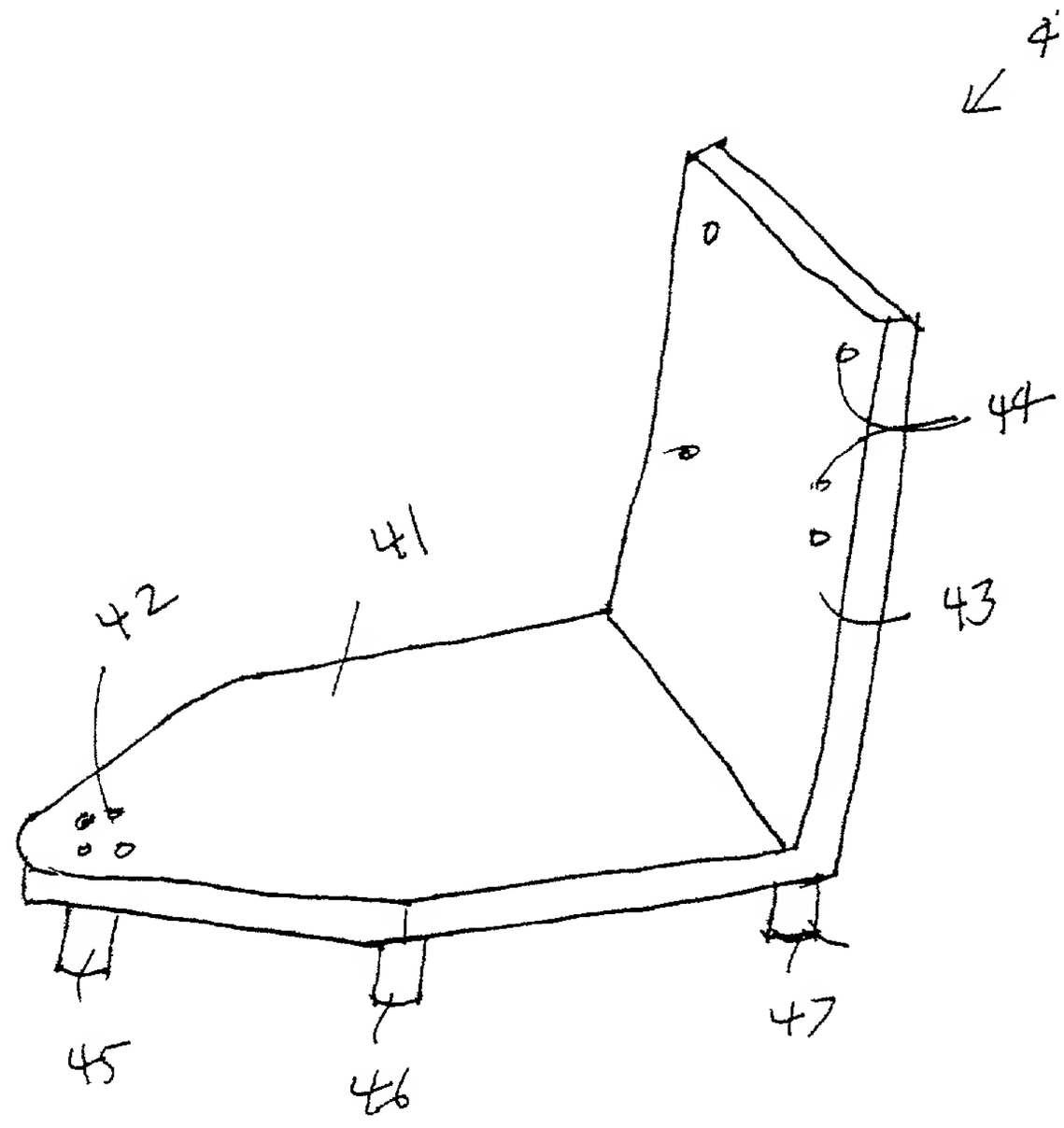

FIG. 3

Attorney file: 5360r3
EA-00049

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled USER COUPLED WORKSPACE SHOCK ISOLATION SYSTEM , the specification of which

[x] is attached hereto.
[ ] was filed on _____ as
Application Serial No._____
and was amended on _____. (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
			Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Serial no.	(Filing Date)	(Status-patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Marvin Jacobson, Reg. No. 20,196, Carl L. Johnson, Reg. No. 24,273
Patrick M. Hogan, Reg. No. 29,543 and Glenn W. Bowen, Reg. No. 22,704,

Address all telephone calls to:
Carl L. Johnson at telephone no. 1-651-222-3775
Address all correspondence to:
Carl L. Johnson
Jacobson and Johnson
Suite 285, One West Water Street
St. Paul, Minnesota 55107-2080

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Robert J. Monson

Inventor's signature Robert J. Monson Date 12-13-99
Residence 1027 Brenner Ave., St. Paul, MN 55113 Citizenship USA
Post Office Address 1027 Brenner Ave., St. Paul, MN 55113
Full name of sole or second inventor Allen L. Arndt

Inventor's signature Allen L. Arndt Date 12-15-99
Residence 12228 Allen Drive, Burnsville, MN 55337 Citizenship USA
Post Office Address 12228 Allen Drive, Burnsville, MN 55337
Full name of sole or third inventor Samuel A. Runge

Inventor's signature Samuel A. Runge Date 1-3-2000
Residence 102 Goose Meadow Drive, Forest , VA 26511 Citizenship USA
Post Office Address 102 Goose Meadow Drive, Forest , VA 26511